

The Rejection

In the Final Rejection the examiner has maintained the original rejection of all claims in the application (claims 1-17) as being unpatentable under 35 U.S.C. 103(a) over Takechi et al in view of Cameron. No other basis has been asserted for rejecting any claims.

With the further explanation of the basis for the rejection as set forth in the examiner's "Response to Amendment" dated May 20, 2004, Applicants believe the examiner is reasoning as follows: 1) the fuel processor 1 of Takechi et al, including the burners 107, the evaporator 5, the reaction layer 6, and the compartment enclosing those components is considered as the "reformer"; and 2) although the office action correctly states that "...Takechi et al do not expressly disclose the specific purging steps" of applicants' invention (1st paragraph on page 6 of the office action), the Takechi et al process necessarily causes the incidental (secondary) effect of purging the "reformer" with flowing air.

Summary of the Invention

(In the following description of the invention, drawing reference numerals have been added but do not appear in the quoted portions of the claims.) In the operation of a fuel cell system [100], the invention is a process for shutting down the fuel cell [102] and its associated fuel processing system [104], wherein the fuel processing system [104] includes "...a fuel reformer [128] in series flow relationship with a catalytic shift converter [130]..." (amended claim 1, lines 5-6). During normal fuel cell operation "...organic fuel [106]....is directed, in series, through the catalyst bed of the fuel reformer [128], the catalyst bed of the shift converter[130], and fuel cell anode flow field [114]..." (amended claim 1, lines 7-9). As set forth in amended claim 1 at lines 11-14, the steps of the shut-down procedure comprise:

- a. disconnecting the load [120] from the cell [102] and halting the flow of organic fuel from the source [106] to the fuel processing system [104]; and then
- b. purging the reformer [128] of residual hydrogen by flowing air through the reformer [128] catalyst bed.

Response to Rejection

In applicants' specification, claims and drawing, the "reformer" 128 is intended to represent and mean only the reaction layer or catalyst bed through which the organic fuel travels and within which the conversion of that fuel to hydrogen takes place. For example, in the Background Information portion of applicants' specification focuses on "catalytic components of a fuel processing system for converting organic fuel to hydrogen....[that] require purging upon shut-down....to remove residual hydrogen". (Page 1, lines 11-16). More specifically, on page 1 at lines 16-27, it discusses the need for purging reformer catalyst beds containing nickel, and that the prior art describes such purging using inert gas.

On page 3 of the specification, in discussing the purging of fuel processing components according to a preferred embodiment of applicants' invention it states: "In any event, the purge gas moves through the reactors more or less as a front. Reaction on the various catalyst beds reduces the hydrogen content at the leading edge of the front to essentially zero." (page 3, lines 18-22 of the original specification, emphasis added) On page 6, lines 14-18 it states: "The components of the fuel processing system of this embodiment each involve catalytic reactions, and include a desulfurizer 126, an autothermal reformer 128, a shift converter 130, and a selective oxidizer, 132. These components are arranged in series flow relationship." The next following paragraph discusses the catalytic reactions that occur within the catalyst beds of these components, all of which are well known in the art.

Based upon the foregoing, applicants believe a fair reading of the originally filed claim language, in light of the specification and drawing, already limit the purging steps of the shut-down process to the purging of the fuel processor component catalyst beds, such as the reformer catalyst bed. However, to more clearly

patentably distinguish applicants' claims from Takechi et al, and based upon the supporting language of the specification as set forth above, applicants have added the words "catalyst bed" throughout claims 1-14 and 16-17. For example, step (b) of applicants sole independent amended claim 1 now requires "purging the reformer of residual hydrogen by flowing air through the reformer catalyst bed".

With these amendments to the claims, even if the examiner's argument is correct that the Takechi et al process incidentally causes purging of the Takechi et al reformer 1 with air, Takechi et al does not cause or even suggest any incidental or direct purging of the Takechi et al reformer catalyst bed 6 with air.

On page 6 of the office action the examiner discusses the Cameron reference as follows: "Cameron discloses a fuel cell that may be purged with inert gas by combusting the hydrogen fuel with air and passing the combusting product gasesthrough the cell.....Preferably the combustor includes a catalyst.....If the product gases are to be passed into the cell, the stoichiometry of the combustion should be controlled so that hydrogen is absent." While this may be true, Applicants' invention is not the use of combustion products for a fuel cell purge, regardless of whether those combustion products are hydrogen free.

Cameron does not suggest, as part of the shut-down procedure, that residual hydrogen be purged from a reformer catalyst bed using air. Cameron does not even use a reformer to provide fuel for the fuel cell. The combustor of Cameron, even if it were a reformer, is only used (a) to provide heat for the fuel cell (col. 3, lines 43-47) (or for its circulating electrolyte) or (b) to generate inert combustion products (not air) for purging the fuel cell (col. 3, lines 34-36). The combustor itself is not purged upon shut-down of the cell.

Applicants' amended claim 1 includes the step of purging the reformer catalyst bed with air. As set forth above, the Cameron process uses a combustor, not a reformer, and does not even purge the combustor. Takechi et al includes a reformer catalyst bed, but does not suggest an air purge of the reformer catalyst bed upon shut-down. Thus, the examiner's argument in the last paragraph of page 6, that it would have been obvious to one skilled in the art.....to perform the

specific purging steps of Cameron in the fuel cell system of Takechi et al cannot support a rejection of amended claim 1 or any other claim (all of which depend from amended claim 1 since neither reference or their combination describes, discusses, suggests or makes obvious to a person skilled in the relevant art an air purge of a reformer catalyst bed within a fuel cell system upon shut-down of the fuel cell.

Having amended claims 1-14 and 16-17 and specifically pointed out how the amended claim language patentably distinguishes over the art, applicants now believe the claims are in condition for allowance. Withdrawal of the final rejection of claims 1-17 and entry of the amended claims and allowance thereof is respectfully requested.

It is applicants' position that the first office action dated January 8, 2004 failed to set forth in sufficient detail the basis for the rejection now being asserted. In that office action the examiner stated on page 5 that "Takechi et al do not expressly disclose the specific purging steps." This was taken to mean that Takechi et al did not disclose using air to purge the reformer. The explanation set forth in the paragraph bridging pages 7 and 8 of the Final Rejection dated May 20, 2004 was not in the first office action. For that reason, applicants believed the Cameron reference was being used to show a reformer purging step and argued that it did not.

The examiner's new reasoning puts an entirely different light on the basis for the rejection; and that new reasoning is what has now prompted applicants to amend the claims. Because applicants had no prior opportunity to rebut the argument now being presented, nor to modify the claims to overcome that argument, the currently amended claims should be entered regardless of whether they put the claims into condition for allowance.

In any event, entry of the amendment to the specification and the amended claims is requested for the reason they put the case into better condition for appeal.

A listing of the claims as required under 37 CFR 1.121(c) is enclosed herewith.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Stephen E. Revis', with a stylized flourish at the end.

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